WHAT IS CLAIMED IS:

1. A flowmeter comprising:

a vibratable flowtube;

a driver connected to the flowtube and operable to impart motion to the flowtube;

a sensor connected to the flowtube and operable to sense the motion of the flowtube and generate a sensor signal; and

a controller connected to receive the sensor signal, the controller being operable to determine a first flow rate of a first phase within a two-phase flow through the flowtube and determine a second flow rate of a second phase within the two-phase flow.

2. The flowmeter of claim 1 wherein the first phase includes a gas and the second phase includes a liquid.

3. The flowmeter of claim 1 wherein the controller is operable to input an apparent density of the two-phase flow detected by the flowmeter and output a corrected density of the two-phase flow.

4. The flowmeter of claim 3 wherein the controller is operable to correct the apparent density based on a theoretical relationship between the apparent density and the corrected density.

5. The flowmeter of claim 3 wherein the controller is operable to correct the apparent density based on an empirical relationship between the apparent density and the corrected density.

6. The flowmeter of claim 3 wherein the controller is operable to correct the apparent density based on a table storing relationships between the apparent density and the corrected density.

7. The flowmeter of claim 1 wherein the controller is operable to input an apparent mass flow rate of the two-phase flow detected by the flowmeter and output a corrected mass flow rate of the two-phase flow.

8. The flowmeter of claim 7 wherein the controller is operable to correct the apparent mass flow rate based on a theoretical relationship between the apparent mass flow rate and the corrected mass flow rate.

9. The flowmeter of claim 7 wherein the controller is operable to correct the apparent mass flow rate based on an empirical relationship between the apparent mass flow rate and the corrected mass flow rate.

10. The flowmeter of claim 1 wherein the controller is operable to input an apparent first phase fraction of the two-phase flow detected by the flowmeter that defines an amount of the first phase in the two-phase flow and output a corrected first phase fraction of the two-phase flow.

11. The flowmeter of claim 1 wherein the controller is operable to input a first phase fraction of the two-phase flow detected by a phase fraction sensor that is external to the flowmeter.

12. The flowmeter of claim 1 wherein the controller is operable to determine the first flow rate and the second flow rate based on corrected values for a detected density and detected mass flow rate of the two-phase flow.

13. The flowmeter of claim 12 wherein the controller is operable to determine the first flow rate and the second flow rate based on a corrected value for a detected first phase fraction that defines an amount of the first phase in the two-phase flow.

14. The flowmeter of claim 1 wherein the controller is operable to determine the first flow rate and the second flow rate based on densities of the first phase and the second phase, respectively.

15. The flowmeter of claim 1 wherein the controller is operable to determine a first superficial velocity of the first phase and a second superficial velocity of the second phase, based on the first flow rate and the second flow rate, respectively.

16. The flowmeter of claim 15 wherein the controller is operable to determine a flow regime of the two-phase flow, based on the first superficial velocity and the second superficial velocity.

17. The flowmeter of claim 16 wherein the controller is operable to determine a slip velocity between the first phase and the second phase, based on an average velocity of the first phase and an average velocity of the second phase.

18. The flowmeter of claim 17 wherein the controller is operable to provide corrections to the first flow rate and the second flow rate, based on the first and second superficial velocities, the determined flow regime, or the slip velocity, to thereby obtain a corrected first flow rate and a corrected second flow rate.

19. A method comprising:

determining a bulk density of a two-phase flow through a flowtube, the two-phase flow including a first phase and a second phase;

determining a bulk mass flow rate of the two-phase flow; and

determining a first mass flow rate of the first phase, based on the bulk density and the bulk mass flow rate.

20. The method of claim 19 comprising determining a second mass flow rate of the second phase, based on the bulk density and the bulk mass flow rate.

21. The method of claim 19 wherein determining the bulk density comprises:
determining an apparent bulk density of the two-phase flow; and
correcting the apparent bulk density to obtain the bulk density.

22. The method of claim 21 wherein correcting the apparent bulk density comprises inputting the apparent bulk density into a theoretical relationship that relates the apparent bulk density to a corrected bulk density.

23. The method of claim 21 wherein correcting the apparent bulk density comprises inputting the apparent bulk density into an empirical relationship that relates the apparent bulk density to a corrected bulk density.

24. The method of claim 21 wherein correcting the apparent bulk density comprises inputting a first density of the first phase.

25. The method of claim 24 comprising determining a first phase fraction of the two-phase flow, based on the bulk density, the first density of the first phase, and a second density of the second phase.

26. The method of claim 25 wherein determining the first mass flow rate of the first phase comprises determining the first mass flow rate based on the first phase fraction and the first density.

27. The method of claim 20 comprising determining a first superficial velocity of the first phase and a second superficial velocity of the second phase, based on the first mass flow rate and the second mass flow rate, respectively.

28. The method of claim 27 comprising determining a flow regime of the two-phase flow, based on the first superficial velocity and the second superficial velocity.

29. The method of claim 28 comprising determining a slip velocity between the first phase and the second phase, based on an average velocity of the first phase and an average velocity of the second phase.

30. The method of claim 29 comprising providing corrections to the first flow rate and the second flow rate, based on the first and second superficial velocities, the determined flow regime, or the slip velocity.

31. The method of claim 20 wherein the first phase includes a gas and the second phase includes a liquid.

32. A flowmeter controller comprising:

a density correction system operable to input an apparent density of a two-phase flow and output a corrected density of the two-phase flow, the two-phase flow including a first phase and a second phase;

a mass flow rate correction system operable to input an apparent mass flow rate of the two-phase flow and output a corrected mass flow rate of the two-phase flow; and

a flow component mass flow rate determination system operable to determine a first mass flow rate of the first phase, based on the corrected density and the corrected mass flow rate.

33. The flowmeter controller of claim 32 wherein the flow component mass flow rate determination system is operable to determine a second mass flow rate of the second phase, based on the corrected density and the corrected mass flow.

34. The flowmeter controller of claim 33 wherein the first phase includes a liquid and the second phase includes a gas.

35. The flowmeter controller of claim 34 comprising a phase fraction determination system operable to determine a corrected phase fraction of the two-phase flow,

wherein the flow component mass flow rate determination system is operable to determine the first flow rate and the second flow rate based on the corrected phase fraction.

36. The flowmeter controller of claim 35 wherein the phase fraction determination system is a void fraction determination system that determines an amount of the gas in the two-phase flow.

37. The flowmeter controller of claim 34 comprising a superficial velocity determination system operable to determine a first superficial velocity of the first phase and a second superficial velocity of the second phase.

38. The flowmeter controller of claim 37 wherein the flowmeter controller comprises a flow regime determination system operable to determine a flow regime of the two-phase flow.

39. The flowmeter controller of claim 38 wherein the flow regime determination system is further operable to determine a phase slip velocity with respect to an average velocity of the first phase and an average velocity of the second phase.

40. The flowmeter controller of claim 39 wherein the flow component mass flow rate determination system is operable to improve the determination of the first mass flow rate and the second mass flow rate, based on the first and second superficial velocities, the flow regime, or the phase slip velocity.